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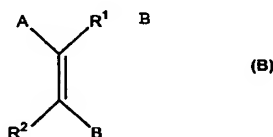
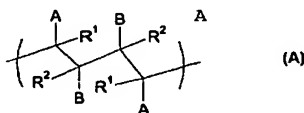
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For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: RECOVERING MATERIALS



(57) Abstract: A process for recovering materials from a subterranean formation, for example in enhanced oil recovery, comprises:  
(A) (a) (i) selecting a first polymeric material having a repeat unit of formula (A) wherein A and B are the same or different, are  
selected from optionally-substituted aromatic and heteroaromatic groups and at least one comprises a relatively polar atom or group  
and R<sup>1</sup> and R<sup>2</sup> independently comprise relatively non-polar atoms or groups; or (ii) selecting a first polymeric material prepared  
or preparable by providing a compound of general formula (B) wherein A, B, R<sup>1</sup> and R<sup>2</sup> are as described above, in an aqueous  
solvent and causing the groups C=C in said compound to react with one another to form said first polymeric material; (b) selecting  
a second polymeric material which includes a functional group which is able to react in the presence of said first polymeric material  
to form a third polymeric material; (c) causing the formation of said third polymeric material by a reaction involving said first and  
second polymeric materials; and (d) contacting the subterranean formation with said third polymeric material; or (B) contacting the  
formation with a polymeric material (hereinafter "said third polymer material") which is a product of a reaction involving: (a) a first  
polymeric material as described in (A) (a) (i) or (ii); and (b) a second polymeric material which includes a functional group which  
is able to react in the presence of said first polymeric material to form said third polymeric material.

## INTERNATIONAL SEARCH REPORT

International Application No

PL 17 GB 03/01402

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E21B43/22 E21B43/25 C08F2/10

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E21B C08F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 317 895 A (UNIV BRADFORD) 8 April 1998 (1998-04-08) cited in the application page 1, line 24 - page 8, line 9 page 18, line 10 - line 26 Examples + Claims -----	1-28
A	GB 2 030 575 A (AGENCY IND SCIENCE TECHN) 10 April 1980 (1980-04-10) cited in the application page 1, line 83 - page 2, line 80 -----	1-28
A	US 4 039 542 A (PANZER HANS PETER ET AL) 2 August 1977 (1977-08-02) example 33 -----	1-28

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB 03/01402

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-28

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

## 1. Claims: 1-28

The subject-matter of independent claim 1 is a process of recovering materials from a subterranean formation, comprising :

- selecting a first polymeric material (see possible choices and formulas in claim 1)
- selecting a second polymeric material which includes a functional group which is able to react in the presence of said first polymeric material to form a third polymeric material
- causing the formation of said third polymeric material by a reaction involving said first and second polymeric material
- contacting the subterranean formation with said third polymeric material

## 2. Claim : 29

The subject-matter of independent claim 29 is a formulation comprising salt water and a periodate.

## 3. Claim : 30

The subject-matter of independent claim 30 is a treatment method comprising contacting said formation with a formulation having a first viscosity, wherein said formulation includes a polymeric material having 1,2-diol linkages; and contacting the polymeric material with a cleavage composition which is able to cleave 1,2-diol linkages of the polymeric material and thereby reduce the viscosity of the formulation.

## INTERNATIONAL SEARCH REPORT

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 2317895	A	08-04-1998	AU 734288 B2	07-06-2001
			AU 4309797 A	14-04-1998
			BR 9712059 A	18-01-2000
			CN 1230970 A	06-10-1999
			EP 0935622 A1	18-08-1999
			WO 9812239 A1	26-03-1998
			JP 2001500558 T	16-01-2001
			NO 991276 A	12-05-1999
			NZ 335075 A	30-03-2001
GB 2030575	A	10-04-1980	JP 1063325 C	22-09-1981
			JP 55023163 A	19-02-1980
			JP 56005761 B	06-02-1981
			JP 1063333 C	22-09-1981
			JP 55062905 A	12-05-1980
			JP 56005762 B	06-02-1981
			DE 2932376 A1	14-02-1980
			US 4272620 A	09-06-1981
US 4039542	A	02-08-1977	US 4006247 A	01-02-1977
			US 4127719 A	28-11-1978
			US 4109072 A	22-08-1978
			US 4113934 A	12-09-1978
			US 4074055 A	14-02-1978